

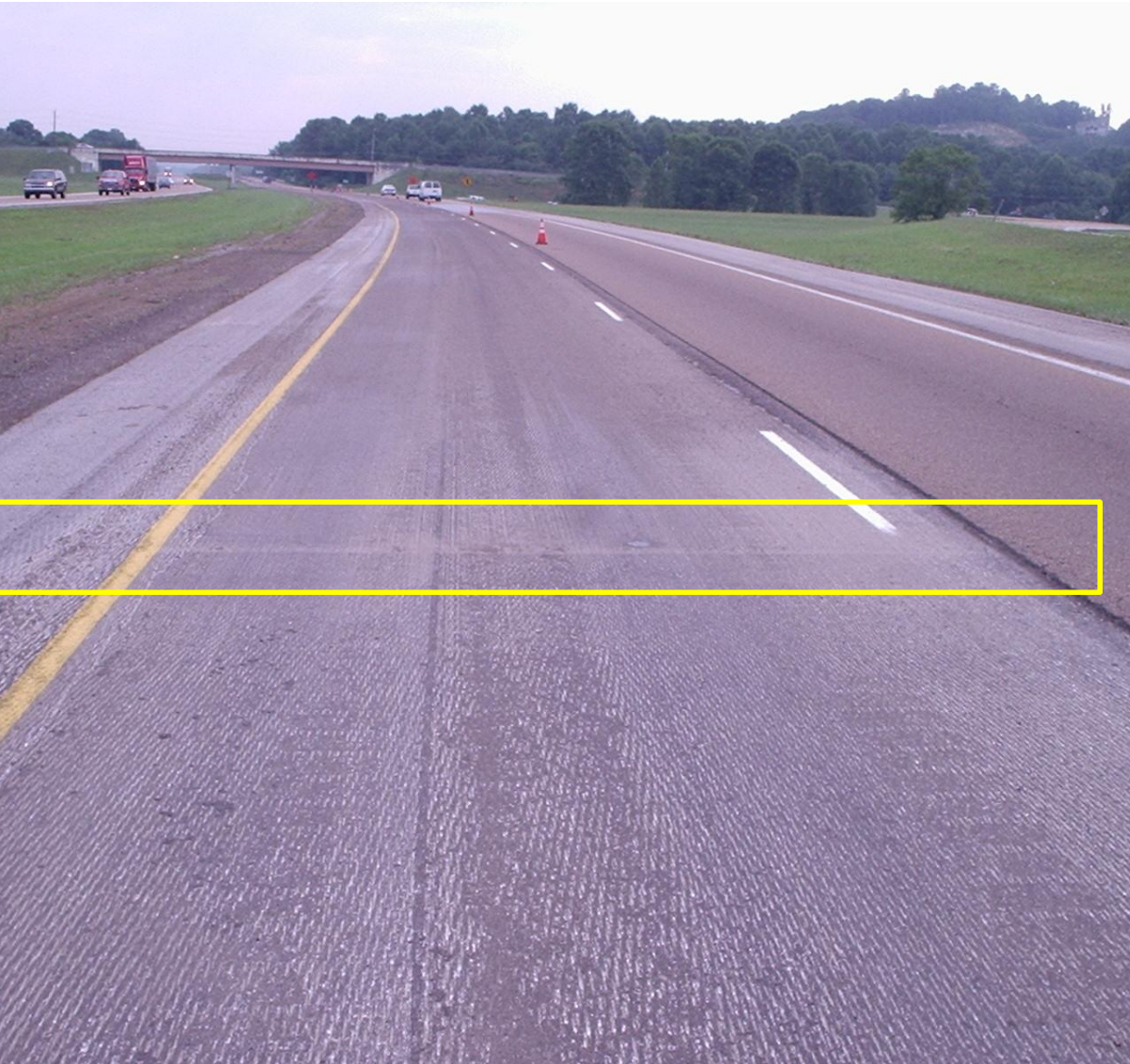
Milling For Smoothness



You need a control point



Continuous Milling



There are a lot of forces generated during milling. When you stop so do the forces.

Plus all of the teeth now cut in one spot, no longer spread out.



Cut Depth

Most Machines today cut from at least 0-14" .

Machines cannot control scabbing. You should go deeper or come up to get to stable material.

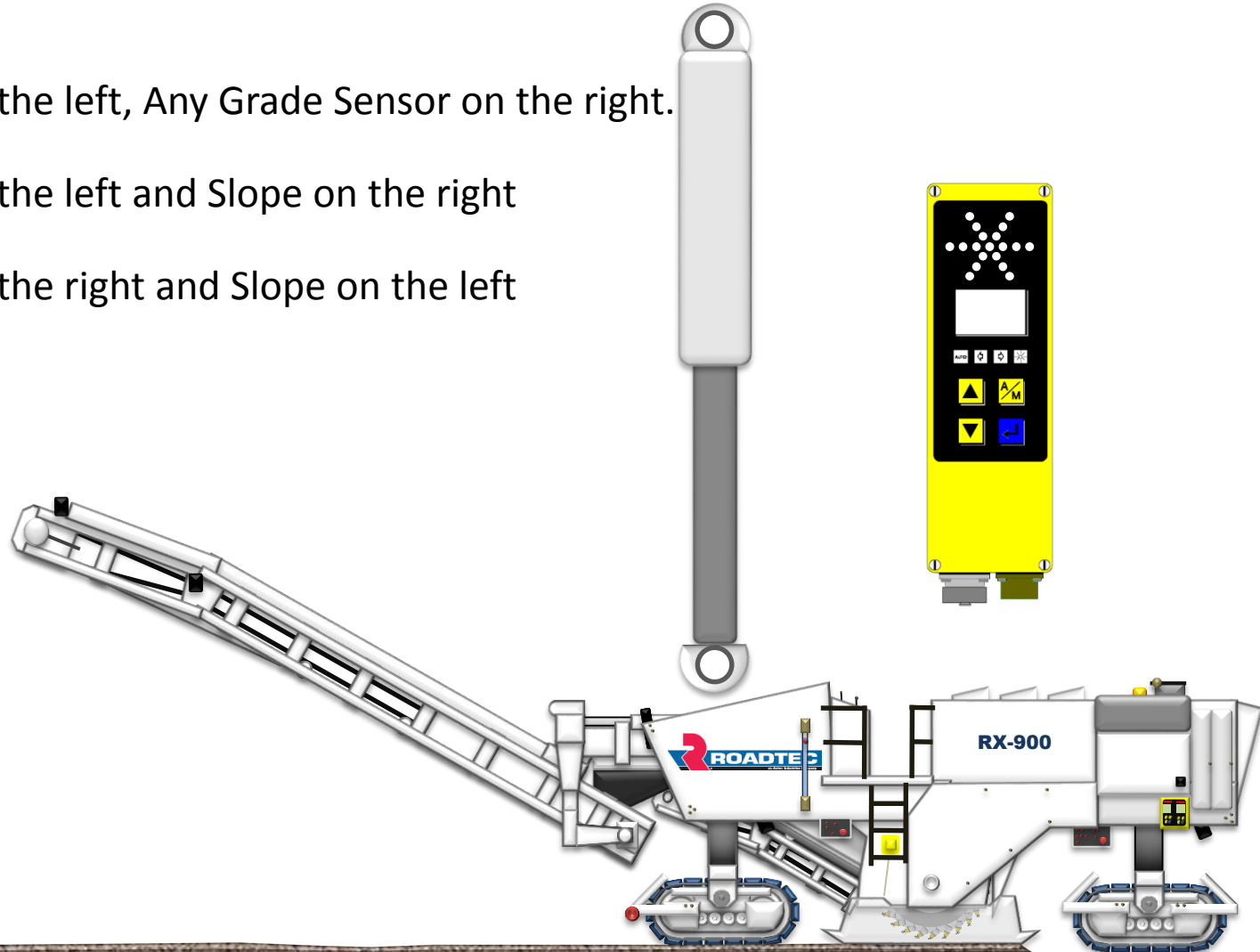


What is controlled?

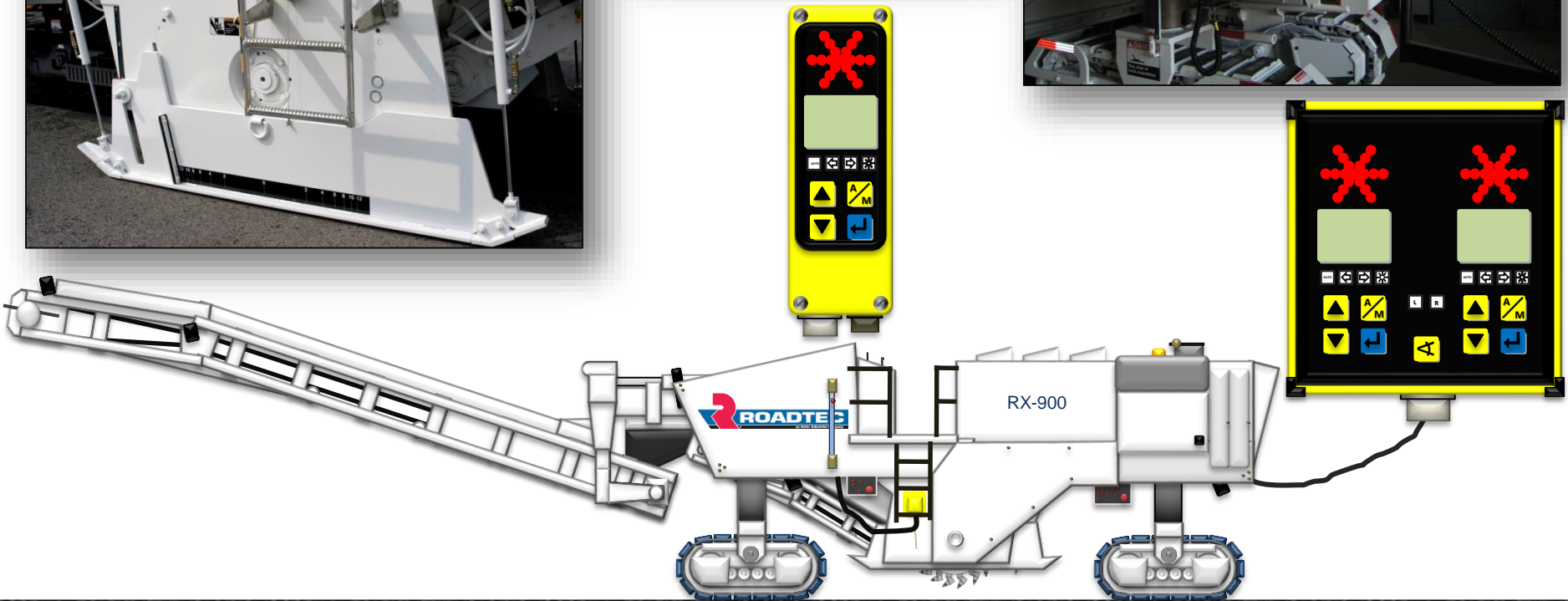
Any Grade Sensor on the left, Any Grade Sensor on the right.

Any Grade Sensor on the left and Slope on the right

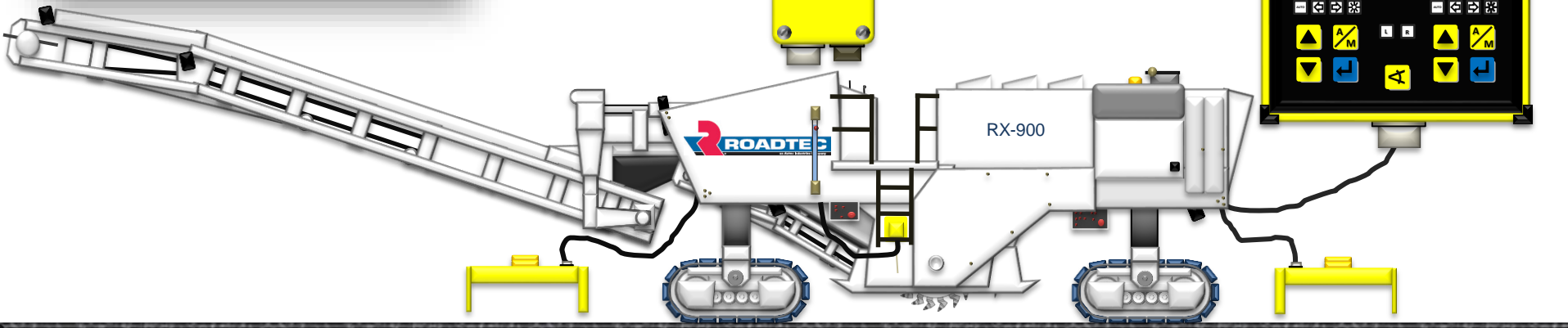
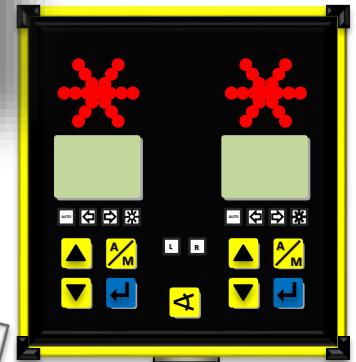
Any Grade Sensor on the right and Slope on the left



2D Control Systems



Averaging Systems



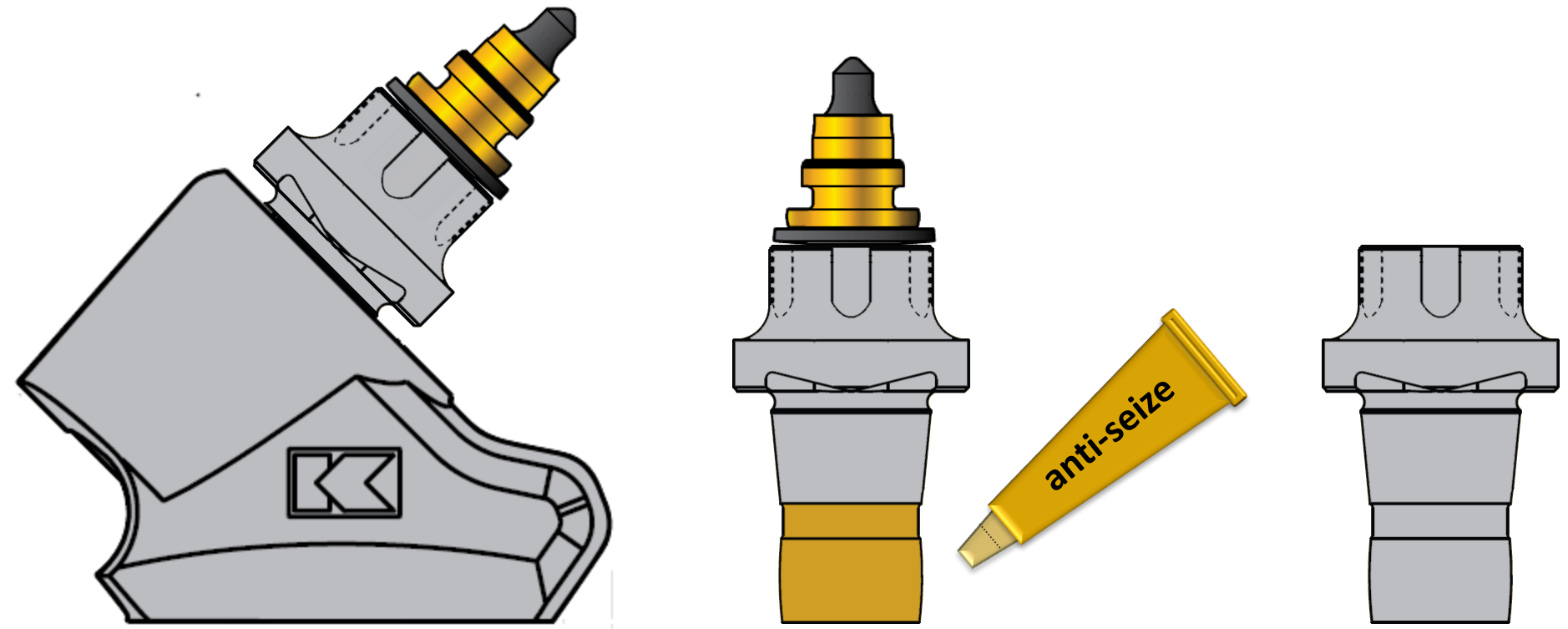
3D Control Systems



Mill to Grade based on Position



Proper Holder Wear



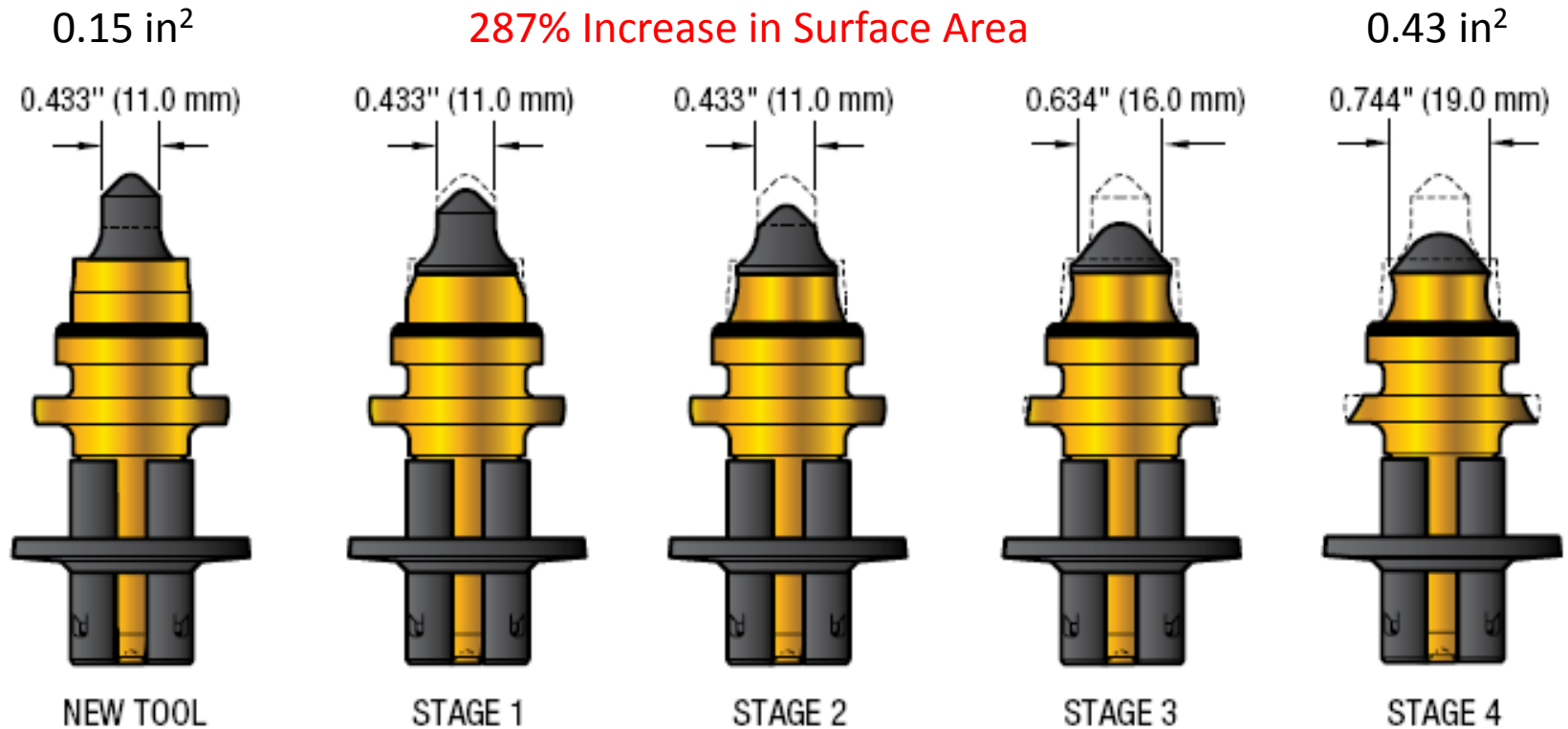
Look at the Holders



Caliper set at EXACTLY 2"



Tool Wear Characteristics

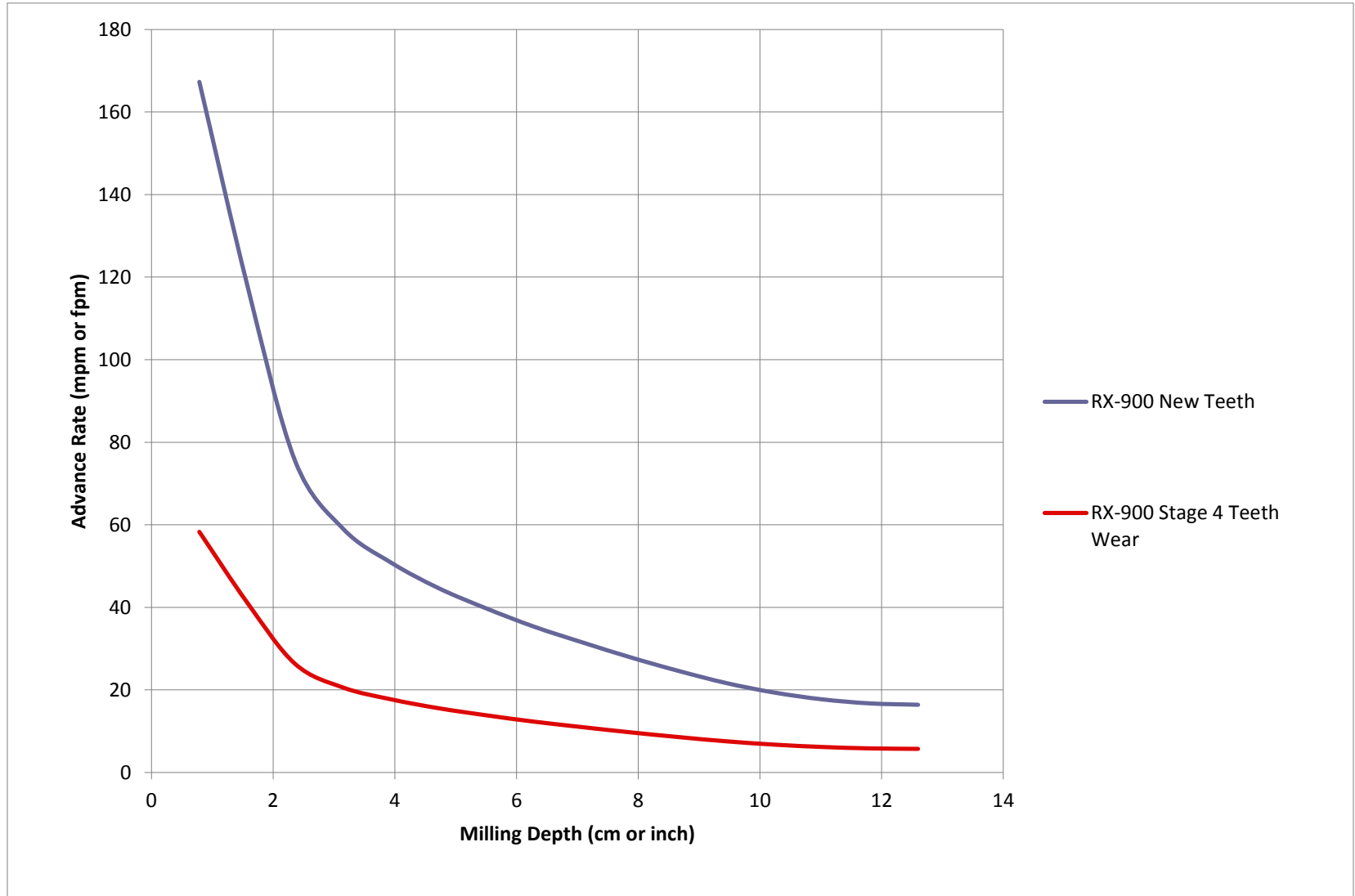


At Stage 3
Tool has lost 0.365" [9.3 mm] of
gage height

Proper Maintenance



Production Tradeoff



Keep it Clean



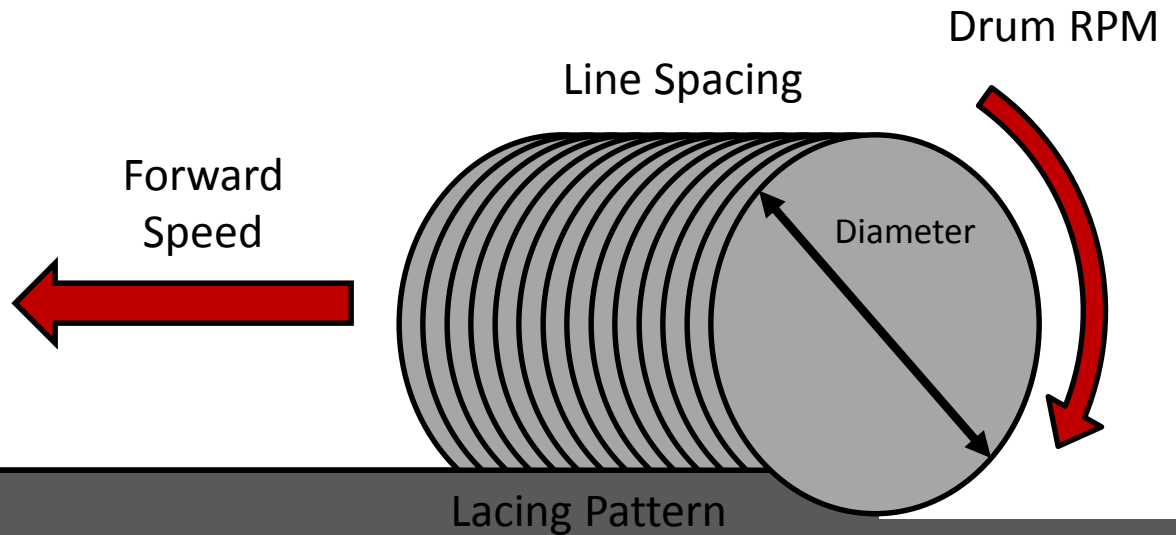
Your Cut surface is only as good the surface you Walked on.

If you have this to work with you will never achieve grade.

Why?



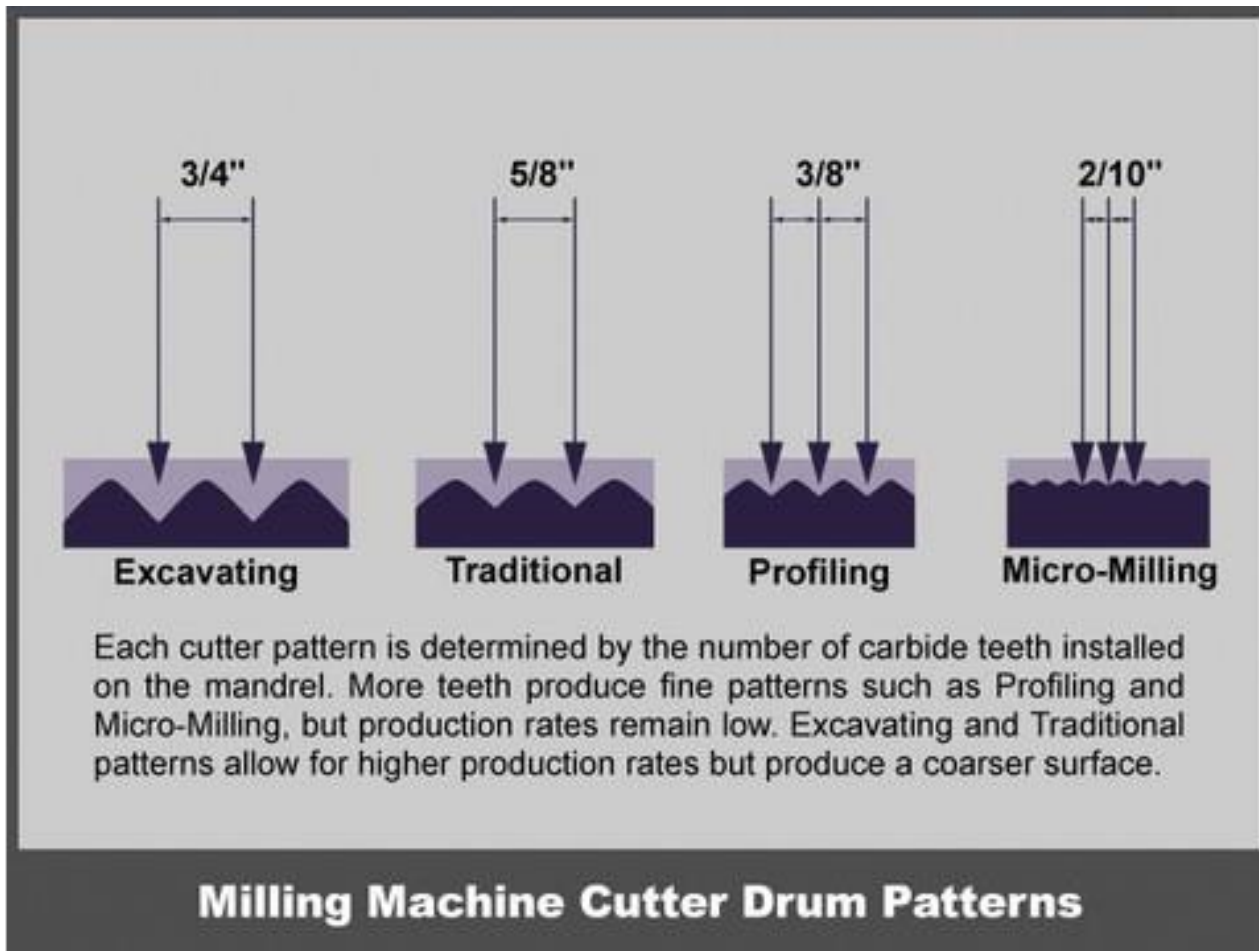
The Math of Milling



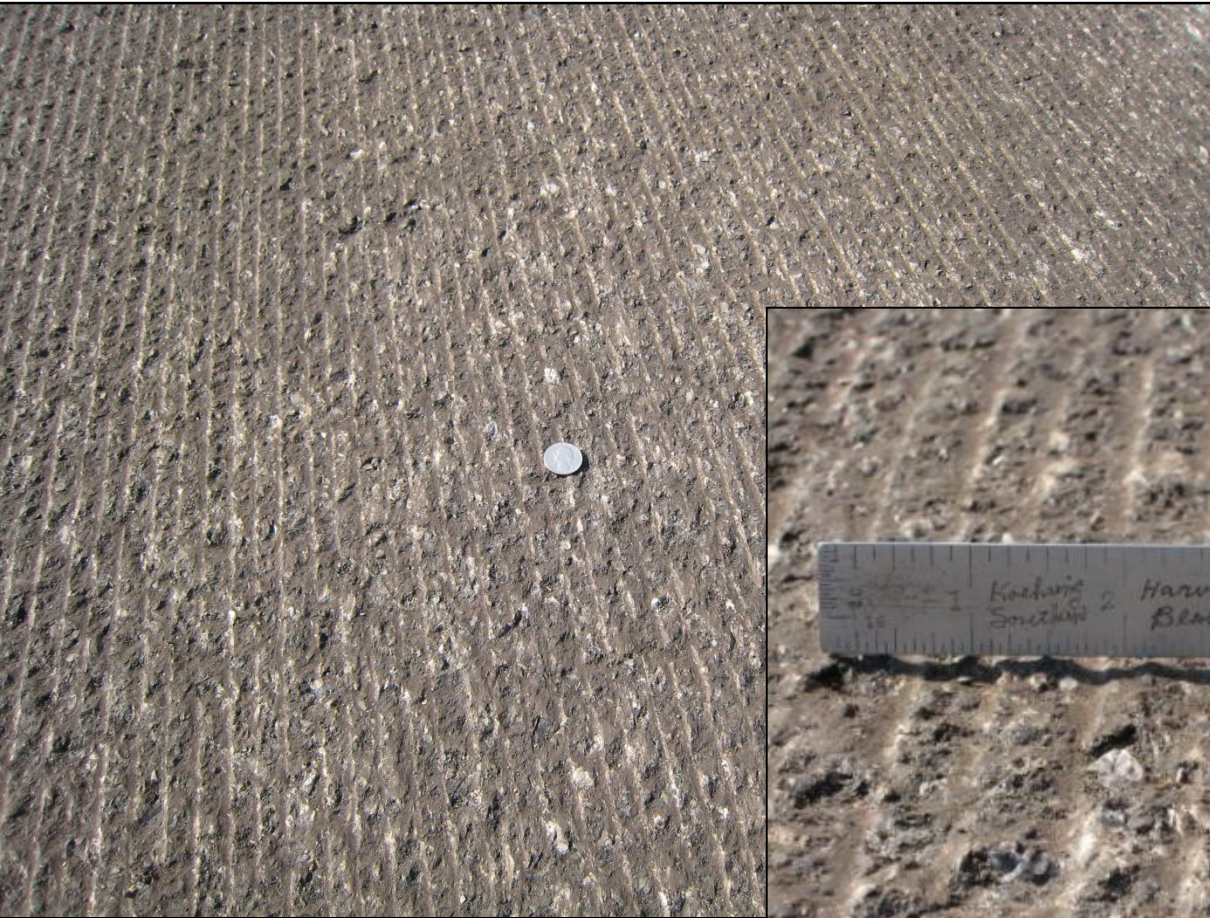
The 4 Main Factors that
Affect Surface Texture

1. Line Spacing
2. Forward Speed
3. Drum RPM
4. Lacing Pattern

Line Spacing and Texture



5/8" (16 mm) Triple Wrap at 30 fpm



2/10" (5mm) Triple Wrap Lacing Pattern

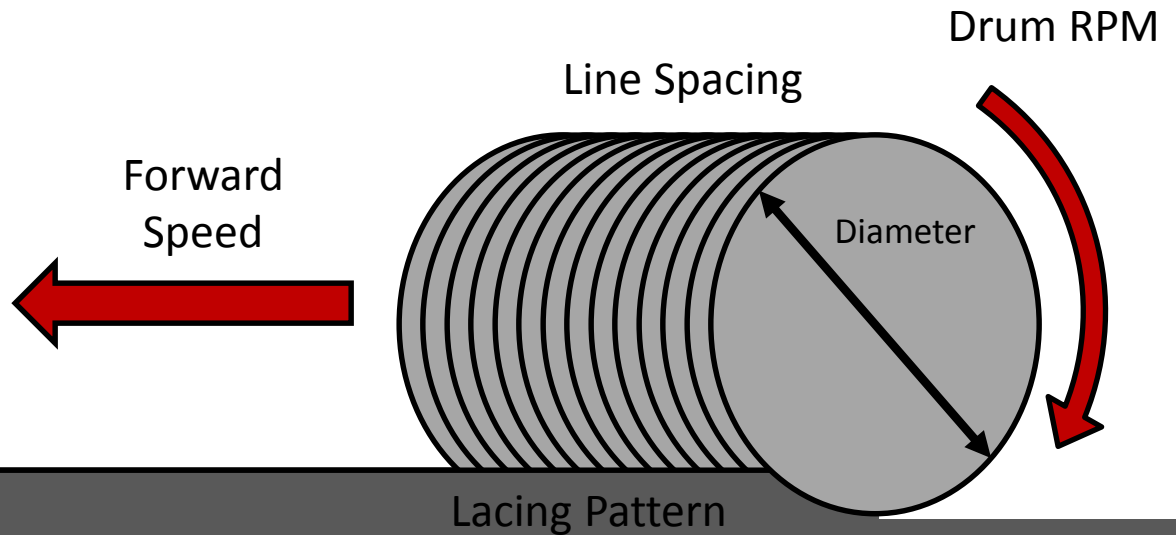


Amount of Tools

12'6" (3.5 m) Full Lane Drum		
Line Spacing	# of Teeth	Cost of Teeth
5/8" (16 mm)	268	\$1340
3/8" (9 mm)	406	\$2030
0.2" (5 mm)	770	\$3850

Nearly 3 times more teeth
Nearly 5 times the cost
No more quick change holders

The Math of Milling



The 4 Main Factors that
Affect Surface Texture

1. Line Spacing
2. Forward Speed
3. Drum RPM
4. Lacing Pattern

Advance Rate = 30 fpm

Advance Rate = 30 fpm

Drum Diameter = 46"

Drum Speed = 100 rpm

Machine
Advance

3.6"




 0.071"

30 fpm



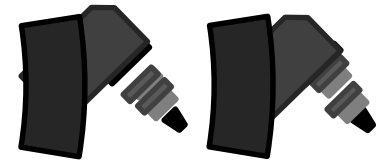
Advance Rate = 60 fpm

Advance Rate = 60 fpm

Drum Diameter = 46"

Drum Speed = 100 rpm

Machine
Advance
7.2"




 0.28"

60 fpm

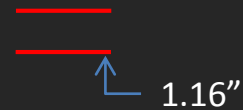
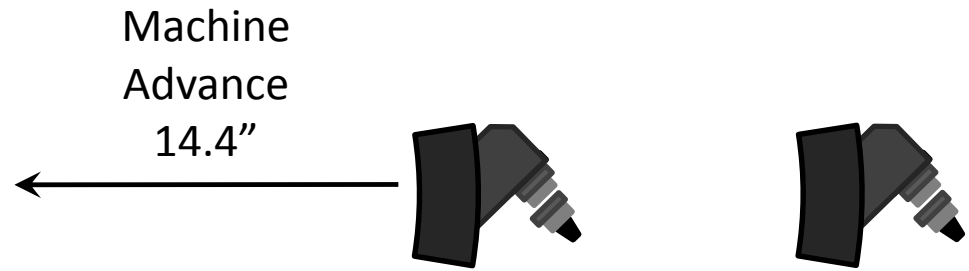


Advance Rate = 120 fpm

Advance Rate = 120 fpm

Drum Diameter = 46"

Drum Speed = 100 rpm



120 fpm

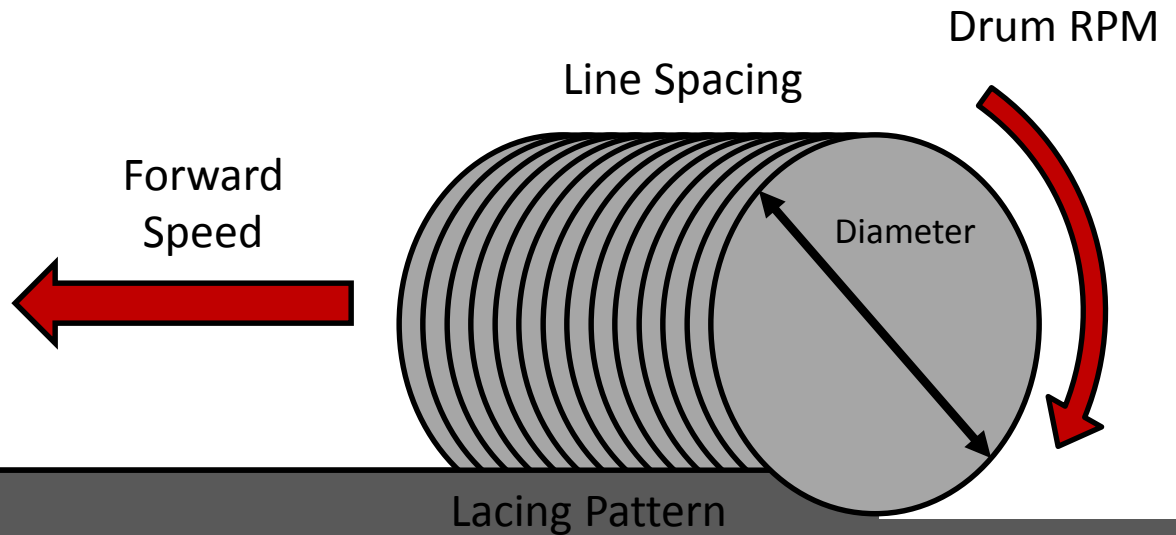


30 fpm vs. 120 fpm

2.3 miles in a day vs. 9.1 miles in a day



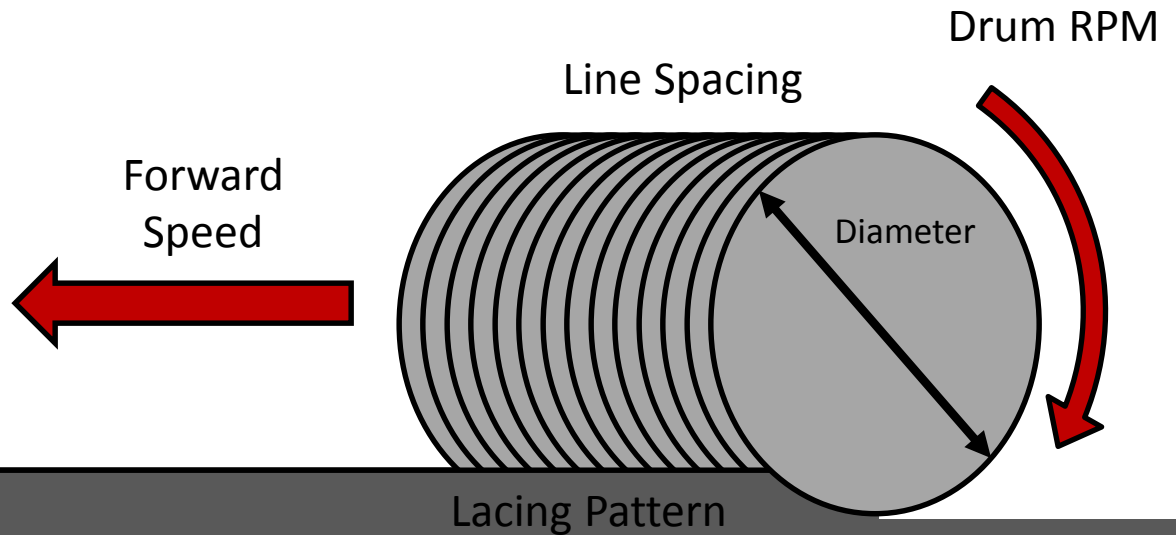
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Double Hit Drums



Above
Double hit Quad wrap drum

Standard triple wrap drum
Below



Pattern Comparison



5/8" Triple Wrap at 100 FPM



7/8" DHQW at 100 FPM

Thank you & Slow Down

